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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,042	06/26/2003	Ryutaro Kusunoki	8375-000014	8006
27572	7590	08/25/2004	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C.			PHAM, HAI CHI	
P.O. BOX 828			ART UNIT	
BLOOMFIELD HILLS, MI 48303			PAPER NUMBER	
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DATE MAILED: 08/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/607,042	Applicant(s) KUSUNOKI, RYUTARO	
	Examiner Hai C Pham	Art Unit 2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/26/03 & 12/01/03</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

3. Claims 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7:

- The phrase "**and/or**" at line 37 renders the claim indefinite because the claim does not clearly set forth the metes and bounds of the claimed invention, thereby rendering the scope of the claim unascertainable.

Claim 8 is dependent from claim 7 and is therefore indefinite.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roy et al. (U.S. 5,381,162).

Roy et al. discloses an ink jet head driving apparatus comprising a drive signal generating unit (signal source 37), which outputs a drive signal (drive signal 100, Fig. 2) for ejecting an ink droplet to an ink jet head (9) having a pressure chamber (22), which contains an ink, a nozzle (14), which communicates with the pressure chamber and ejects the ink in the pressure chamber, and an actuator (piezoelectric element 36), which changes a capacity of the pressure chamber to be expanded or contracted based on the drive signal, wherein the drive signal generating unit sequentially generates as drive signals for ejecting ink droplets: a first pulse (refill pulse 102) in the shape of a first rectangular wave, which expands the capacity of the pressure chamber, a second pulse (ejection pulse 104) in the shape of a second rectangular wave, which contracts the capacity of the pressure chamber (col. 8, lines 12-68), a third pulse in the shape of a third rectangular wave, which expands the capacity of the pressure chamber, and a fourth pulse in the shape of a fourth rectangular wave, which contracts the capacity of the pressure chamber (the unit drive signal 100 consists of a set of pulses 102, 104 and 106 for ejecting a single ink droplet, the unit drive signal is repetitively generated by the signal source 37 for ejecting subsequent ink droplets, and thus the third and fourth pulses are part of the following unit drive signal).

Although Roy et al. does not explicitly disclose time interval between a pulse width center of the first pulse and a pulse width center of the third pulse is set to 1 AL (1 AL is 1/2 of an acoustic resonant cycle of the ink in the pressure chamber), and a time interval between a pulse width center of the second pulse and a pulse width center of the fourth pulse is set to 1 AL, Roy et al. does however teaches the time duration of each of the pulses 102 and 104 along with the wait time 106, and thus the total time duration for the unit drive signal 100 being adjusted for different inks such that the drive signal has an energy content at a minimum at the dominant acoustic resonant frequency of the ink in the ink pressure chamber (col. 13, lines 9-38). In other words, the time interval between the pulse width center of the first [refill] pulse 102 and the pulse width center of the third pulse (or succeeding refill pulse) would be set in accordance with the acoustic resonant cycle of the ink in the pressure chamber. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to set the time interval between the pulse width center of the first pulse and the pulse width center of the third pulse at 1AL as claimed, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The motivation for doing so would have been to minimize the formation of satellite ink drop as suggested by Roy et al.

With regard to claims 2-4, Roy et al. further teaches:

- a ratio between a pulse width of the first pulse and a pulse width of the third pulse, and a ratio between a pulse width of the second pulse and a pulse width of

the fourth pulse are determined, respectively, according to a damping rate of residual vibration of the ink in the pressure chamber (the relationship between the pulse widths of the pulses 102 and 104 as well as that of the time duration of the wait pulse 106, and thus the relationship between the same functional pulses, is set to adapt for the formation and ejection of the ink meniscus),

- a pulse width of the first pulse is set to be equal to a pulse width of the third pulse and a pulse width of the second pulse is set to be equal to a pulse width of the fourth pulse, and a ratio between a voltage amplitude of the first pulse and a voltage amplitude of the third pulse and a ratio between a voltage amplitude of the second pulse and a voltage amplitude of the fourth pulse are determined, respectively, according to a damping rate of residual vibration of the ink in the pressure chamber (Figs. 6 and 7) (col. 15, lines 31-34),
- the drive signal generating unit sequentially generates the first pulse to the fourth pulse, so that a plurality of ink droplets are ejected by repeatedly generating the first to fourth pulses resulting in adhering at one point on a recording medium, whereby one pixel is formed (the unit drive signal 100 is repetitively generated by the signal source 37 for ejecting subsequent ink droplets).

6. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roy et al. in view of Takahashi (U.S. 6,109,716).

Roy et al. discloses all the basic limitations of the claimed invention including the sum of the pulse widths of the pulse 102 in the first unit drive signal and that of the

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succeeding pulse 102 being constant (e.g., twice the pulse width of the refill pulses 102), but fails to teach the rate of the pulse width of the first pulse and the pulse width of the second pulse being obtained as a value according to a desired ejection volume.

Takahashi discloses an ink jet printing apparatus having a print head driven by ink-viscosity dependent drive pulse, which consists of a series of first pulse (P1) and second pulse (P2), the pulse width of either pulses being set in accordance with the volume of ink per droplet (col. 8, lines 45-50).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to set the rate of the pulse width of the first pulse and the pulse width of the second pulse according to a desired ejection volume in the device of Roy et al. as taught by Takahashi. The motivation for doing so would have been to provide a stable ejection of ink droplets for a satisfying quality of print as suggested by Takahashi.

Allowable Subject Matter

7. Claim 7 would be allowable if rewritten or amended to overcome the rejections under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

8. Claim 8 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

9. The following is an examiner's statement of reasons for allowance: the primary reason for the indication of the allowability of claim 7 is the inclusion therein, in

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combination as currently claimed, of the limitations related to a first drive signal being different from a second drive signal in the number and configuration of the drive pulses and wherein "the second drive signal in which a fifth pulse in the shape of a fifth rectangular wave, the fifth pulse expanding the capacity of the pressure chamber, and a sixth pulse in the shape of a sixth rectangular wave contracting the capacity of the pressure chamber are sequentially generated with a predetermined wait time being provided therebetween, and in which a time interval between a pulse width center of the fifth pulse and a pulse width center of the sixth pulse is set to $2AL$, and the first drive signal or the second drive signal is selectively output according to an ejection volume of ink droplets", which are not found taught the prior art of record considered alone or in combination.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai C Pham whose telephone number is (571) 272-2260. The examiner can normally be reached on M-F 8:30AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D Meier can be reached on (571) 272-2149. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



HAI PHAM
PRIMARY EXAMINER

August 19, 2004